TITLE OF THE INVENTION

SYSTEMS AND METHODS FOR PROVIDING ADAPTIVE TOOLS FOR ENABLING COLLABORATIVE AND INTEGRATED DECISION-MAKING

This application claims priority from U.S. Provisional Application Serial No. 60/408,875 filed September 9, 2002, and U.S. Provisional Application Serial No. 60/432,661, filed December 12, 2002. The entirety of these provisional applications are incorporated herein by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to systems and methods for presenting data, and specifically to systems and methods for presenting filtered data.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 illustrates a dynamic intersection of career, user attributes, and educational programs, according to one embodiment of the present invention.

Figures 2A-2H illustrate logic diagrams indicating how levels and sublevels are filtered, according to one embodiment of the present invention.

Figure 2I is a flowchart diagram illustrating an example of how levels and sublevels are filtered, according to one embodiment of the present invention.

Figures 3A and 3B illustrate application overview 300, according to one embodiment of the present invention.

Figure 4 illustrates a method of filtering data 400, according to one embodiment of the present invention.

Figure 5 illustrates a method of using an adaptive graphical user interface 500, according to one embodiment of the present invention.

Figure 6 illustrates a method of using an assessment combinator 600, according to one embodiment of the present invention.

Figure 7 illustrates a method of using a self-concept assessor 700, according to one embodiment of the present invention.

Figure 8 illustrates a method of using an education plan designer 800, according to one embodiment of the present invention.

Figure 9 illustrates a method of using an adaptive backsteppable filter 900, according to one embodiment of the present invention.

Figure 10 illustrates a method of using an assessment manager 1000, according to one embodiment of the present invention.

Figures 11A-11S illustrate curricular design screen shots.

Figures 12A-12U illustrate explore/job market screen shots.

Additional features and advantages of the present invention will become more apparent from the detailed description set forth below when taken in conjunction with the Figures in which like reference numbers indicate identical or functionally similar elements.

DESCRIPTION OF THE INVENTION

While pursuing education and career objectives and goals, prospective and continuing students, face many questions. Correct and timely answers to these

questions are very important, particularly early in the life of a student, as they could make the emotional and financial difference between staying on-track towards personal goals, or being off-track without knowing it.

The present invention comprises a system and method for presenting data relating to at least one individualized instructional program, comprising: receiving filtering criteria, accessing at least one repository of data relating to the individualized instructional program, and identifying data responsive to the filtering criteria.

The present invention develops and presents an optimal individual-matched and integrated education and career plan. The present invention provides decision support techniques for obtaining integrated education-career planning and implementation solutions, supported by a vast education and career knowledge base. In one embodiment, the present invention is used for middle school through college education levels. In other embodiments, the present invention is used for other levels of education, including pre-school, elementary, and post graduate education.

The present invention allows students to acquire quick, accurate, complete, and comprehensive answers to questions related to career possibilities and potential educational paths to these careers.

The present invention also allows guidance counselors and advisors to quickly and efficiently create a rigorous education and career plan optimized for each individual student. The present invention integrates potential careers, potential education programs, and student attributes in an easy-to-use package that

each student can use to do most of the work, optionally with some assistance or review by a parent or counselor.

The present invention can be used in any educational field, including, for example: engineering, computers and information technology, health, physical, biological and life sciences, business management, education, and social and behavioral science.

While the present invention is described in the context of education, those experienced in the art will see that use outside the education field is possible. Potential other fields include, for example: use by local governments and states to rapidly analyze the general career direction of students for policymaking projection of state workforce levels; use in preventive medicine and health management, to produce a treatment explorer to explore and investigate optimal individualized options (e.g., on the basis of personal traits and family history) in diagnosis and treatment for diseases, even before the onset of disease; and use in designing individualized financial portfolios for exploring and investigating optimal individualized options in financial products. In these cases, the education-related databases described below are replaced by other databases relevant to the field (e.g., a disease diagnostic and treatment database).

Intersection of Career, User Attributes, and Educational Programs

Figure 1 illustrates a dynamic intersection of career, user attributes, and educational programs, according to one embodiment of the present invention.

Figure 2A illustrates four levels of support functions: primary (e.g., Institutions, Funding & Employers) 205, secondary (e.g., Pursuits) 210, tertiary

(e.g., Programs & Standards) 215, and quaternary (e.g., Curricula & Courses) 220, according to one embodiment of the present invention. A user may use the present invention at any level, depending on the need to seek either general decision support, or increasingly specific decision support. Users also have flexibility to limit searches to an education universe only, a career universe only, or an integrated education-career universe, with or without personal attribute integration. All levels are structurally interlinked for full, integrated functionality.

The primary level 205 provides integrated education-career exploration and investigation. This exploration and investigation is matched to a user, in an alternate embodiment. For example, a user can enter a request for information on colleges that provide special academic programs for certified musicians to be trained as computer programmers, preferably located in the rural United States, close to branches of major IT companies, with an admission policy that accommodates someone with a high school GPA of 2.5, and an SAT score of 1000.

At the secondary 210 and tertiary 215 levels, the present invention supports integrated education-career exploration and investigation that is more detailed and specific than the broad picture provided at the primary level. All levels utilize user attributes as a dependable delimiter of options, to obtain reliable, individualized solutions.

The quaternary level 220 provides personalized educational scenarios in detail, using extremely detailed information available from the tertiary level. For example, courses, course descriptions, course equivalencies, curricula requirements, and formal education standards are used.

Figure 2B illustrates the primary, secondary, tertiary, and quaternary levels and sublevels (or modules), according to one embodiment of the present invention. Primary level 205 is Institutions, Funding & Employers. The sublevels are, for example: Agencies & Companies 201, Industries 202, Engineering Disciplines 203, Colleges 204, Financial Resources 224, and Geographical Locations 206.

Secondary level 210 is Pursuits. The sublevels are, for example: Internships 207, Job Links 208, Job Descriptions 209, Engineering Careers 225, Strategies for Employment 211, and Geographic Locations 212.

Tertiary level 215 is Programs & Standards. The sublevels are, for example: College Program Types 213, College Programs 214, Distance/Online Programs 226, Secondary School Standards 216, College Entrance Testing 217, and Geographical Locations 218.

Quaternary level 220 is Curricula & Courses. The sublevels are, for example: Curricula 219, Course Types 227, Course 221, Course Tutoring 222, and Geographic Locations 223.

The base data filtering system is a two-tier filter system: (1) intra-module filtering and (2) inter-module filtering. Figures 2C-2F illustrate logic diagrams indicating how the modules may be undergo *intra*-filtering, according to one embodiment of the present invention. Thus, for example, large datasets from module C3 (Job Descriptions) may be filtered (i.e., delimited for the user) within that module by options in Occupation, Employment Level, Education Level, Salary Range and Job Title.

Furthermore, Figures 2G and 2H illustrates a data navigation logic diagram and chart indicating how the levels may in turn undergo *inter*-level filtering,

according to one embodiment of the present invention. Thus, for example, information from module R1 (Agencies & Companies) may be filtered (e.g., delimited with) information from modules R2 (Industries), R3 (Engineering Disciples), R5 (Financial Resources), RCPA-GL (Geographical Locations), C1 (Internships), C2 (Job Links), C3 (Job Descriptions), C4 (Engineering Careers), P1 (College Program Types), A1 (Curricula), and A2 (Course Types).

Figure 2H is a flowchart diagram illustrating how levels and sublevels are filtered, according to one embodiment of the present invention. The example of filtering in sublevel R1 (Agencies & Companies) is shown. In step 250, a list of modules is displayed. In step 251, a user selects a module. In step 252, it is determined whether the module is "Agencies & Companies". If no, in step 253, further navigation takes place. If yes, in step 254, a list of company types is displayed. In step 255 the user selects a company type. In step 256, a list of company sizes is displayed. In step 257, the user selects a company size. In step 258, a list of options for a company location is displayed. In step 259, the user selects an option for the company location. In step 260, it is determined if the company location option selected is regions. If no, in step 261, it is determined if the company location option selected is subregions. If no, in step 252, it is determined if the company location option selected is states. If no, in step 263, the list of all companies matching the type and size criteria is displayed. If some companies were marked during previous navigation, they are marked again.

In step 264, if the company location option is states, the list of states is displayed. In step 265, the user selects at least one state. In step 266, a list of companies in the selected state(s) matching the type and size criteria is displayed.

If some companies were marked during previous navigation, they are marked again.

In step 267, if the company location option is subregions, a list of subregions is displayed. In step 268, the user selects at least one subregion. In step 269, a list of companies in the selected subregion(s) matching the type and size criteria is displayed. If some companies were marked during previous navigation, they are marked again.

In step 270, if the company location option is regions, a list of regions is displayed. In step 271, the user selects at least one region. In step 272, a list of companies in the selected region(s) matching the type and size criteria is displayed. If some companies were marked during previous navigation, they are marked again.

In step 273, the user can mark (choose) at least one company. In step 274, the user can view detailed information about the marked companies. The process then returns to step 250 and repeats.

Application Overview

Figures 3A and 3B illustrate application overview 300, according to one embodiment of the present invention. The application overview 300 comprises a presentation layer 305, a business logic layer 310, and a data access layer 315.

Presentation Layer. The presentation layer 305 comprises a list tool 306 and a detail window 307.

List Tool. The list tool 306 is used for navigational purposes. The list tool 306 displays a list of items (e.g., representing modules, tables, limiters, ranges, and

items from the database). Graphical representation of the items is different for different types of items. The item can contain, for example, a checkbox, various forms of highlighting, and different appended icons. The list tool 306 uses orbital navigation, which is an unrestricted always all-forward navigation. Back navigation (e.g., undo level) is also supported in one embodiment. The list tool 306 allows long lists to be displayed in a way that allows intra-module filtering and inter-module filtering options. The list tool 306 also allows orbital navigation.

Detail Window. The detail window 307 displays detailed information about the items selected in the list tool 306. The detail window 307 also enables comparison of the items. The detail window 307 displays textual information together with all relevant multimedia information (e.g., audio, pictures, video files). The detail window 307 effectively uses the available display area by dynamically changing the sizes of the displayed objects. The detail window 307 displays all relevant information in one place. The detail window 307 also performs an intelligent comparison of particular items together with a collateral view. The detail window 307 also dynamically changes the viewing area so that an item of interest occupies more area than other items.

Business Logic Layer. The business logic layer 310 comprises a history 311, a basket 312, a filtering algorithm 313, and a multimedia integrator 314.

Filtering Algorithm. The filtering algorithm 313 limits the number of possibilities according to previously selected data. The filtering algorithm 313 works with data in the database and with lists of previous selections, and uses the database model to dynamically and effectively create and optimize queries. The

filtering algorithm 313 allows queries to be constructed "on the fly" and uses data models to create queries.

History. The history 311 remembers visited items (e.g., ranges, limiters, modules, module items) and enables easy navigation to the visited items. The history 311 stores lists of previously displayed items, and if the user clicks on an item in the list, the history 311 enables displaying of that item.

Basket. The basket 312 stores items selected by user into a formatted repository. The basket 312 stores items checked by a user, keeps a used list generation (i.e., items that were checked previously must be checked when the list is displayed again). The basket 312 also preserves stored items for (re)display, printing or sharing. In addition, stored items can be sent to another user (e.g., a counselor) for review.

Multimedia Integrator. The multimedia integrator 314 gathers all relevant data from the disparate databases into one coherent whole, personalized for the user, and advises a user how to continue navigating the present invention. The multimedia integrator 314 uses multimedia files together with database information and filtering processes to display all information. In addition, all information is displayed intelligently at one place. It also uses the history of visited modules and items to recommend for the next navigation. The multimedia integrator also makes intelligent recommendations for further path application.

Data Access Layer (Data Storage). The data access layer 315 comprises database logic 316, database 317, and multimedia files 318.

Database Logic. The database logic 316 is a communication level between the application logic and the data. It creates responses to data queries, provides

simple manipulations with queries using the database model (no history or other session data is used during these manipulations), and sends queries to the database and provides simple manipulations with the results.

Database. The database 317 stores all textual data and all lists used. It also stores all relations between the data. The database can also retrieve requested data quickly and efficiently.

Multimedia files. The multimedia files 318 are displayed in the application.

Filtering Method Overview

Figure 4 illustrates a method of filtering data 400, according to one embodiment of the present invention. In step 405, the user enters a filtering request (e.g., a request to navigate the data - translated as a request to use the data as a delimiter, or as a constraint object). In step 410, a start table and an end table in the database are determined. The start table is determined by the module the user was in when the user started navigating, and the end table is determined by the requested module (where the user wants to end navigating). In step 415, it is determined if the start table and the end table are closely related. The start table and end table are closely related if there exists a direct relationship in the data model. If the start table and the end table are not closely related, in step 420, it is determined if the start and end tables are loosely related. The start table and end table are loosely related if there is no direct relationship in the data model, but there is an indirect relationship (i.e., there is a route in the data model from one table to another table via an interim table or tables). In one embodiment, the maximum number of interim tables is set to two, or another function exists to

related items from one table to another (e.g., the function is strictly case oriented, or specific for certain tables and built using external knowledge). If the start table and the end table are not loosely related, in step 421, the filtering algorithm cannot be used because there is no utilizable information. In this case, all items from the end table are displayed and the process ends. If the start table and the end tables are loosely related, in step 422, a factor is set to "low value". The process then moves to step 430.

If the start and end tables are closely related, in step 425, the factor is set to "high value". The process then moves to step 430, where it is determined if the end table contains any unprocessed items. This algorithm processes all items, one after another, in a sequential manner (i.e., one item at a time, one after another). If the end table does not contain any unprocessed items, data from the end table that meet the filtering criteria are displayed in step 435.

If the end table does contain any unprocessed items, in step 440, the next item is taken from the end table. In step 445, the relations data and items from the start table are used to adjust the degree of how the item meets the filtering criteria, multiplied by a factor. In this process, the overall degree of item compatibility is calculated. The degree is defined as a sum of particular compatibilities with particular tables (e.g., filtering criteria). Each particular compatibility is computer first. Then the computer compatibility is multiplied by a factor, so the proximity of relation (e.g., its importance) is taken into account. In step 455, it is determined if there is any preclusive conditions that are met. For each table, a defined set of preclusive conditions is set. If any of these conditions is met, the filtering algorithm knows that the considered item is not acceptable as a compatible result.

The preclusive conditions are defined strictly for specific tables and typically uses specific data in items and specific external information (e.g., from a suer's profile). If there are any preclusive conditions that are met, in step 460, the item is not considered to meet the filtering criteria. The process then returns to step 430.

If there are not any preclusive conditions that are met, in step 465, it is determined if the degree is higher than the specified threshold. A specific threshold value is set for a particular solution. The threshold value is determined experimentally, in some cases. If the value is too high, few items are considered to be compatible. If the value is too low, too many items are considered to be compatible. If yes, in step 470, item is considered to meet the filtering criteria, and the process returns to step 430. If no, in step 475, it is determined if there is a table deeper in the history that has not been processed. The history contains a list of tables that were used during navigation in the past. This program determines a level of compatibility for each item in the end table for each table in the history. Tables in the history are stored in an array and are taken one after another If there is not a deeper table in the history, in step 460, the item is not considered to meet the filtering criteria, and the process returns to step 430. If there is a deeper table in the history, in step 480, this table is designated as the new start table, the factor is decreased in step 485, and the process returns to step 415.

Additional Features

Adaptive Graphical User Interface (GUI). Rather than using a "one-size-fits-all" GUI, the adaptive GUI personalizes the GUI's "look and feel", using the user's characteristics (e.g., age, gender, and maturity) to maximize the user's

experience. For example, a GUI for adolescent females may be chosen that displays videos of women in the workplace.

The adaptive GUI adapts to the user's profile in at least two ways: it optimizes the layout of the GUI for optional user experience in performing tasks, and it optimizes the function of the GUI.

To optimize the layout of the GUI elements that are identified as profile-relevant by the personal agent factor (PAF), a layout appropriateness (LA) method is used. The LA method computes the layout appropriateness of an interface by assigning frequencies and costs to task descriptions (i.e., sequences of user transitions between GUI elements) involved in performing specific tasks with the interface. The costs are derived from the distance a user must travel between GUI elements and also to an index of difficulty (e.g., Fitts Index of Difficulty).

The LA method enables the in-situ generation of a user-tailored, user-optimal layout, until the system again recognizes an off-tolerance user profile change. User profile information (e.g., for user behavior during application use, as captured by the assessment manager; from assessment scores; or from direct user input), if within the norm, will add no changes to the functionality of the base GUI components, and thus the GUI display. However, new user profile elements (e.g., use behavior), once outside the set norm references, will effect functional changes to the base GUI components, and potential layout changes to GUI display.

In optimizing the adaptive GUI function, to better provide the user with tailored resources, the present invention uses a personal agent framework (PAF). The PAF coordinates numerous user profile files. Thus, the user's application user

behavior is evaluated continuously during interaction with the application, and the user's profile could change accordingly.

Optimizing the function takes place by linking GUI objects to user profile elements using the PAF. The PAF links the GUI elements with the dynamic repository of user profiles. The PAF also stores objects in a multimedia solution database. After the multimedia solution database has been populated via pilot test and continuous user data capture, PAF uses its case-based learning module to improve and speed up the rate at which it generates user profile-GUI element combinations by matching the profile of the new user with those for which combinations exist in the solution repository. A PAF profile manager acquires and stores user profiles (e.g., user-input personal data, interest topics, assessment results, user habits) and manages user interest hierarchy.

The adaptive GUI can be used for, for example, adaptive learning products, involving intelligent tutoring, self-paced, self-directed education, computer based educational and career assessment tools, and adult learning tools and products.

Figure 5 illustrates a method of using the adaptive graphical user interface 500, according to one embodiment of the present invention. In step 505, output results from an advanced self-concept assessment instrument (or multimedia questionnaire), as well as results from other appropriate assessment instruments are fed into an assessment manager in step 510. In step 510, the assessment manager serves to organize the assessment results and user behavior parameters into profile elements. In step 515, the profile elements for the user are then categorized and classified into norm-referenced user profiles, and stored into a "user profiles" database. In step 520, a comparison of a current user profile is made with the

norm. In step 525, if the profile is within the norm, the base GUI components are activated, and if already activated previously, then the GUI display remains as is in step 550 and there is no change to the GUI. If the user profile is outside of the norm, step 530 activates the personal agent factor (PAF). The PAF innovation serves two key purposes: first, it will use a knowledge base of user profiles and AI techniques to mine, organize and report useful, individualized information or solutions back to the user. Secondly, the PAF will assign GUI component parameter values to user profile elements, thus providing the basis for changes to base GUI components. In step 535, those changes are implemented in the base GUI components. Step 540 determines whether the changes to the function of the base GUI components have resulted in changes to the frequencies of key tasks of the application. If so, then a new GUI layout is generated in step 545 and displayed in step 550, and if not, the GUI remains the same in step 550, with no changes to the current GUI setting.

The adaptive GUI continuously monitors and captures user behavior during application use, and continuously compares that application use behavior to stored values of the norm. In step 555, if user behavior is within the norm, there is no change to the nominal base GUI components of step 525, and the display remains the same in step 550. If user behavior is outside of norm however, that information is passed to the assessment manager step in 510 for processing and subsequent generation of new user profile elements.

Assessment Combinator. The objectives of the assessment combinator are two-fold: (1) Create relevant combinations of assessment items across assessment batteries (i.e., new assessment scales obtained by combining question items from

different assessment instruments) and (2) Assign inferences on combination results to choice options. The assessment combinator will thus be an efficient match-enabler for integrated education-career options by providing a searchable "library" of new combinator result-to-choice option assignments. The assessment combinator will resolve the issue of the systematic assignment of new cross-instrument measures to attributes, and the systematic assignment of such attributes to choice options. If successful, the value-added here will be the generation of a large number of additional cross-instrument sub-scales, with a minimal number of their associated measures able to point users to choice options that existing instruments are currently inherently unable to do. For example, in the case of two conventional instruments (or questionnaires) A and B, each with three assessment components (each requiring a "Yes"/"No" response), the maximum number of intra-instrument sub-scales from each instrument would be {3C1 + 3C2 + 3C3}, or seven, for a total of fourteen (14) sub-scales from both instruments. However, the maximum additional number of component combinations from both instruments, to create new possible cross-instrument sub-scales would then be the square of {3C1 + 3C2 + 3C3}, or forty-nine (49) sub-scales, for a sub-scale total of 63.

The successful use of measures from some of the new sub-scales as new predictive decision pointers will be a significant extension of the state-of-the-art. Such a development will open up new possibilities for decision support, enhance the efficiency and utility of existing decision tools, and maximize the usefulness to the user of user-supplied assessment information.

Figure 6 illustrates a method of using an assessment combinator 600, according to one embodiment of the present invention. In step 605, at least one question from instrument #A is entered. In step 610, at least one question from instrument #B is entered. Instrument #A and instrument #B are, for example, questionnaires related to preferences, skills, abilities, temperment, self-concept, decision-making ability, etc. The questionnaires can be on paper or computerized. An example of a question from instrument #A is "Do you like working in a team?". An example of a question from instrument #B is "Do you like math?". In step 615, at least one answer from instrument #A and at least one answer from instrument #B are combined. In step 620, it is determined if the #A and #B combination translates into at least one user attribute by searching a database of user attributes to see if there is a match. In this example, if a person likes working on a team and likes math, a user attribute can be, for example, that the person is a technical team player. If not, in step 625, the #A and #B combination is discarded. If yes, the #A and #B combination is assigned to the at least one user attribute in the database of user attributes. Thus, in this example, the combination is assigned a user attribute of a technical team player. In step 635, it is determined if the user attribute combination translates to a decision option. Thus, in the example, the choice would be an engineer. If not, in step 625, the user attribute combination is discarded. If yes, in step 650, the user attribute combination is assigned to the at least one decision option.

Self-Concept Assessor. Inaccurately measuring a person's self-concept (e.g., interest and skills) provides inaccurate education and career choice options. Conventional self reports that assess self-concepts (e.g., rating scale) often result in

a masked measure for a self-concept (e.g., a person will answer questions according to social expectations instead of real feelings). The present invention provides a self-concept assessor that captures direct user feedback that is not masked. The present invention does not require substantial verbal skills, inherently reminds a user of his/her own perceptions, and requires a low "social desirability" response. In addition, the present invention separates two embedded utilities: (1) the expression of a range of self-efficacy beliefs in a multi-media presentation for the user to react to in various levels of distinction, and (2) subtle references to accuracy criteria in the same multimedia presentation.

The present invention includes at least one of the following features:

- Levels of occupational and academic interest and skills are assessed.
- Techniques that transfer self-efficacy beliefs into a multi-media presentation (e.g., video, pictures, animations) for a user to react and respond to (e.g., concur with, disagree with, or neutral) are used, where the multi-media presentation also embeds a criterion of accuracy.
- Responses to items are in a Likert-type response format (e.g., concur with, disagree with, neutral) with various levels of distinction (e.g., strong agreement, complete agreement).
- Interests, skills and occupational scales scores will be reported and integrated into the user profile database.
- A criterion-referenced approach, in which the user's self-concept beliefs are assessed repeatedly in reference to an external criterion of accuracy, rather than to a norm, is used.

- The self-concept assessor takes advantage of education and career setting video images incorporated into an "exploration function" of the architecture. It uses a criterion-referenced approach, where a user's self-concept beliefs are assessed repeatedly in reference to an external criterion of accuracy, built around video clips, rather than an approach that compares a user's response against a set of norms. The self-concept assessor captures self-efficacy thoughts, in as filter-free a manner as practicable.

Figure 7 illustrates a method of using a self-concept assessor 700, according to one embodiment of the present invention. In step 705, a self-concept assessment instrument is created. For example, a video is created showing day-to-day activities of an attorney. The user is super-imposed in the video. In step 710, a response combination to attribute ranks is classified. Thus, for example, the user can answer questions about the video, and the responses are classified. In step 715, attributes are assigned to a decision option. In the example, if the user indicated that he liked the attorney occupation, the career option of an attorney is designated. The attributes and career options can be ranked.

Education Plan Designer. The explosion of education options and paths necessitates a mechanism that enables students' exploration of several explore options. The education plan designer provides a convenient tool for user-friendly creation, manipulation, display, and review of educational curricula, using at least one of the following features:

- Enables a user to design a new course plan, or modify an existing plan towards completing a degree at a specific institution, that will lead to a desired career path.

- Enables a user to investigate and if desired, articulate and thus substitute courses with other compatible, institutionally acceptable courses from a variety of sources (e.g., neighboring institutions, e-learning sites).
- Enables a user to investigate and if desired, articulate current curricula with other curricula, with a view to exploring the various implications (career and otherwise) of a change of institution and/or major area of study.
- Enables a user (enrolled or un-enrolled) to perform their own investigations related to transferring, with due regard to required and elective course options, and the career and employment implications of course choices.
- Enables a user to perform audits on their current curriculum towards determining graduation prospects and timing.

The educational plan designer implements the congruence of the education universe with the other two universes of careers and personal attributes. This changes the way students navigate the educational process, by potentially putting in the hands of all students, whether currently enrolled or not, the resources and tools to review, plan and design their own educational plan.

The education plan designer imports the entire curricula, program elements, accompanying protocols and Boolean requirements from a set of institutions relevant to a specific career and educational path into a series of updatable databases. The education plan designer then simulates the process of student advising, transfer student auditing, and curricula design, but does it with an entire advisory environment from the relevant institutions, providing design tools to review, initiate, re-build, and investigate options with significant savings in time. The user will be able to: design a new course plan, or modify an existing one for

academic work at a specific institution, that will lead to a desired career path; investigate and if desired, articulate courses on the primary plan with institutionally acceptable substitute courses from neighboring institutions; investigate and if desired, articulate current curricula with other curricula, to explore implications (e.g., career, graduation) of a change of institution/major area of study; and perform regular/transfer student advising, with due regard to required/elective course options, and their employment and/or internship implications.

Example uses of the education plan designer include: articulating transfer students quickly and efficiently for educational institutions; and embedding the education plan designer in existing products for college-bound students for software publishers.

Figure 8 illustrates a logic diagram of using the education plan designer 800, according to one embodiment of the present invention. Databases include course types 805, courses 810, curricula 815, standards 820, and information on course tutoring 845. Programs include course articulation system 850, advisory/personalized curricula 855, curricular articulation system 860, custom course plan designer 870, pre-frosh advising 875, regular student advising system 880, regular student audit system 885, transfer student advising system 890, transfer student audit 895, and curricular performance 896. Figure 8 illustrates how the databases and programs are logically connects. T represents tertiary, Q represents quaternary, S represents services, and I represents information.

Adaptive Backsteppable Filter. Finding a dynamic intersection, in terms of options, among career, education and user attribute databases requires a robust data integrator that efficiently organizes the vast amounts of multimedia data in

these databases for logical filtering. The adaptive backsteppable filter performs this task. The adaptive backsteppable filter is a three-stage series of data integrator-filters. Stage I dynamically aggregates and stores objects created from combinations of related education database data and career database data. Stage I then forwards a copy of these new objects to Stage II to enable a rejoining of the objects with compatible user profile elements to obtain new "education-user profile objects" and "career-user profile objects". Stage III dynamically creates new objects to obtain "education-career-user profile objects". These integrated objects are then instantly available to the front-end as display-ready information, improving query efficiency and accuracy. The user may also re-engineer a solution by back-stepping to recall how options and paths were derived, providing a useful function to reviewers of user decision processes (e.g., counselors).

Figure 9 illustrates a method of using the present invention, highlighting the adaptive backsteppable filter 900, according to one embodiment of the present invention. The user takes an assessment instrument to discover an initial user profile using the adaptive GUI 905. The user profile undertakes several assessment instruments 910 (e.g., self-concept assessor, assessment manager) and then proceeds to a database of user attributes 910. The user attribute information is provided to the adaptive backsteppable filters 915, 916, and 917, and the personal agent framework 920. The list tool mechanism will then be used to limit the information that is shown. At this point, the GUI 905 can be adapted, if necessary. Now that the user has an adapted GUI 905, information from the databases 931, 932, 933, 934, 935, and 936 is pulled using the database navigators 950 to navigate

all the databases. This filtered information is displayed on the GUI 905. It is also stored in the in the repository 955 (i.e., history/basket).

Integrated Assessor. The integrated assessor is the end-use computer implementation, in software, of the assessment combinator functionality. It is the process for integrating assessment combination assignments into a computer application for direct use by the user. The utility and benefit of the assessment combinator will be completely lost to the user, without the ability to incorporate the new cross-instrument assessment scales and ensuing measures into an application's decision-making mechanism. This involves the creation of a function that stores cross-instrument scale combinations (new sub-scales), and attribute assignments of their potential measures, in a data repository, much like a searchable library, such that choice options are recalled, whenever combinations are matched by the user.

The integrated assessor is illustrated as step 650 of Figure 6, according to one embodiment of the present invention. The integrated assessor combines steps 630 and 640 of Figure 6.

Assessment Manager. The assessment manager serves to organize the assessment results and user behavior parameters into profile elements. It engages in processing and generation of user profile elements for use as delimiters that filter user choice options. Thus, as the assessment manager captures user behavior parameters during application use, or processes assessment results into profiles for immediate use as delimiter filters, it effectively acts as a "just-in-time" administrator and implementer of assessment results, due to a capability as a "just-in-time" generator of user profile elements.

Figure 10 illustrates a method of using the assessment manager 1000, according to one embodiment of the present invention. In step 1005, a history of user navigation patterns is input. In step 1010, user assessment results are input. In step 1015, the assessment manager generates and stores a user profile. In step 1020, delimiting (filtering) functions are performed.

Multimedia Information Integrator and Navigator. The multimedia information integrator and navigator represents a database management function to effectively and efficiently integrate information from the three universes of potential careers, potential educational paths and student attributes. It enables the entire application to display the attributes of integrated functionality. The multimedia information integrator and navigator also allows the application to display recommended paths to the user in an integrated manner, to allow them to navigate through the database in a way that will most likely help the user more quickly reach their goals.

Solution Analyzer. The solution analyzer provides tools and algorithms for extracting and analyzing education-career solution information and sharing it with others. The solution analyzer extracts education-career solution information from solution repositories throughout the application, and then creates a formatted analysis of the extracted solution, on a multimedia template that can be easily shared with other stakeholders. The solution analyzer provides the user with summary information about an investigated solution option, including rationale behind solution options. A detailed solution option analysis allows the user to identify flaws, in the input information and assumptions that generated the solution

path. The solution analyzer allows the user to make critical changes that may lead to a new, more realistic, more compatible and more desirable solution option.

Screen Shots

Curricular Designer Screen Shots. Figures 11A-11S illustrate screen shots that present the entire curriculum sequence of courses, from semester to semester, where the user is able to perform the following functions: Review the details about a course, from descriptions to reviews of syllabi, course objectives, course expected outcomes, course resources, grading policies, course schedule, archive of student's reviews; Adding, dropping and choosing options about what course to take, from a database of courses that include courses from all institutions in the country; finding options about repeating courses; Inputting grades; Tracking Grade Point Averages (GPA's); Modeling future GPA's; Tracking financial costs, financial statistics, academic statistics; Launching a self-guided intelligent tutor to assist with course tutoring; Tracking credits and time needed to graduate, and its projected costs; Investigating the implications of taking a course on future employment or internship opportunities; Investigating the implications of taking a particular course and having a particular GPA on financial aid; Articulating courses with similar courses from appropriate institutions in the country that have closely similar (articulated) courses; Reviewing the possibility for articulating existing courses with matching, accepted courses; Generating an informal transcript; Reviews of merit-based and non-merit-based financial resources; and, Articulating whole curricula with other curricula from appropriate institutions in the country, in order to identify similarities in transfer courses (for transfer students).

Explore/Job Market Screen Shots. Figures 12A-12U illustrate explore/job market screen shots. Figure 12A illustrates the main categories and levels of the application. Figures 12B to 12G take a user from the first level to additional sub-levels, to obtain module and sub-module lists. Figures 12H to 12I illustrates succeeding navigation proceeding in an "always forward" mode (referred to as orbital navigation). Figures 15J to 15T illustrates list of modules within which user has to choose choice options, and the program then presents to the user the possibilities for the remaining categories. For each choice, user is able to review vast multimedia content on the choice item before making a decision to choose. Figure 15U is an assessment user interface.

The present invention is described in terms of the above embodiments for convenience only, and this is not intended to limit the application of the present invention. It will be apparent to one skilled in the relevant arts how to implement the present invention in alternative embodiments. In addition, the Figures and screen shots described above, which highlight the functionality and advantages of the present invention, are presented for example purposes only. The architecture of the present invention is sufficiently flexible and configurable, such that it may be utilized in ways other than that shown in the Figures and screen shots. Further, the purpose of the Abstract is to enable the U.S. Patent and Trademark Office and the public generally, and especially the scientists, engineers and practitioners in the art who are not familiar with patent or legal terms or phraseology, to determine quickly from a cursory inspection the nature and essence of the technical disclosure of the application. The Abstract is not intended to be limiting as to the scope of the present invention in any way.